marked by some peculiarity of spectrum. If such were the case the stars so marked should be found only in or near the milky way and they should be especially numerous and compactly clustered astern of the solar group, they should be more sparsely distributed ahead of it and should be almost completely lacking on either side of the procession. The so-called Orion stars constitute just such a set of objects, marked and distributed as above and presenting the further peculiarities that their apparent motion across the sky is abnormally small and that their number shows no tendency to increase as we pass from the brighter to the fainter magnitudes. All of these characteristics are such as would be possessed by stars formed as above suggested.

In a somewhat similar class are the new or temporary stars believed to result from collisions of some kind and found only in or near the milky way. Why they are limited to the milky way is now apparent, since that is the region, according to the present hypothesis, in which large relative motions are to be expected.

We may look upon double stars as produced by the close approach of a solar to a sirian star under circumstances such that the gravitational bond between them becomes too strong to be broken and the two bodies abide thenceforth in enforced partnership. The size and shape of the orbits in which they shall move about their common center of gravity are determined by the circumstances of their meeting and an elementary analysis suffices to show that the circumstances that tend to produce a small orbit will equally tend to make that orbit nearly round, while those which make a large orbit will equally tend to make it more pronouncedly oval. A statistical examination of double stars shows that they do in fact show this relation among themselves, a small major axis being predominantly associated with a small eccentricity, an agreement between fact and theory that can hardly be accidental.

The test of a valid theory is its power to coordinate apparently unrelated facts without coming into conflict with any of them and, in view of the illustrations of such coordination given above and of others for which space does not here suffice, there is here presented the concept of a definite group of stars moving through a much more widely extended chaos as the best working hypothesis at present attainable with reference to the stellar system.

BOTANICAL NOTES

OUT OF DOOR BOTANICAL STUDY

WITHIN a few weeks students who are planning out of door study in the summer vacation will decide where they will go. In the hope of being able to help such students to decide wisely we here bring together in summary form abstracts from the announcements made by the directors of half a dozen laboratories.

The oldest laboratory of this kind is the Marine Biological Laboratory at Woods Hole, Mass., whose twenty-second session extends from June 1 to October 1. In addition to instruction in botany, zoology, embryology and physiology, opportunities are afforded for investigation in these departments of biology. For botanical students instruction is offered (1) in the morphology and taxonomy of the algae, and (2) the morphology and taxonomy of the fungi. Five buildings with fifty-five private rooms for investigations, and seven general laboratories, constitute the plant, and are supplied with aquaria, collecting apparatus, reagents and glassware. The laboratory has a steam launch, boats, dredges and the apparatus necessary for collecting and keeping alive material for class use or research. Dr. George T. Moore, of Water Mill, N. Y., is in general charge of the botanical work.

The twentieth session of the Biological Laboratory at Cold Spring Harbor, Long Island, begins July 7 and closes August 21. Opportunities for instruction and investigation in botany and zoology are offered. In botany the instruction includes courses in: (1) Cryptogamic botany—especially algae and fungi, and (2) ecology. The laboratory possesses three buildings for study purposes, supplied with needed appliances, and five dormatories, accommodating seventy-five persons. A 28-foot motor boat, with small boats,

collecting apparatus, etc., are supplied. Professor D. S. Johnson, of Johns Hopkins University, Baltimore, Md., is in general charge of the botanical instruction.

The tenth session of the Harpswell Laboratory at South Harpswell, Maine (sixteen miles from Portland), will be held June 14 to September 11. The laboratory is intended for research students only, and for their accommodation has one building affording facilities for fifteen persons. A motor launch, small boats, nets and dredges are provided for collecting, while in the laboratories are glassware, aquaria, microscopes, microtomes, etc., for the work of investigations. Professor J. S. Kingsley, of Tufts College, Mass., is in general charge of the laboratory.

The Minnesota Seaside Station at Port Renfrew, on the west coast of Vancouver Island, will resume its sessions this year, after a vacation of a year. There are two laboratory buildings, and one dormitory and mess hall, for the use of students. The large brown seaweeds are more than usually abundant along the coast near the station, while the forests of this part of the island are wholly unbroken. The session begins about July 6 and ends about the middle of August. Professor Josephine E. Tilden, of the University of Minnesota, Minneapolis, Minn., is in general charge of this station.

The first session of the Marine Biological Laboratory of the Washington State College will be held at Olga, on Orcas Island, in the northerly part of Puget Sound, beginning June 21 and continuing to July 30. The immediate surroundings include the open waters of the sound with their rich marine flora, the tide flats, open land, forests, nearby freshwater lakes, Mt. Constitution (2,400 ft. alt.) with ravines, waterfalls, swamps, etc. A motor launch, row boats, dredges, collecting apparatus, microscopes, etc., are supplied. Instruction and opportunities for investigation are offered in botany and zoology. Professor R. K. Beattie, State College, Pullman, Wash., is in general charge of this station.

Allied to the foregoing is the Mountain Laboratory of the University of Colorado, whose first session will be held (June 14 to July 24) at Tolland, Colorado, in a mountain park at an altitude of nearly nine thousand feet altitude above sea-level. This point is eighteen miles southwest of Boulder, and is in the midst of hills, mountains, moraines, ravines, brooks, mountain meadows and ponds. The rich forest vegetation of the near-by region, and the "timber line" and alpine vegetation within easy reach, afford many interesting ecological problems. Courses in general biology, nature study, plant ecology, anatomy and taxonomy are offered, and opportunities are given for individual work and investigation. Professor Francis Ramaley, of Boulder, Colo., is in general charge of the laboratory.

SOME SOUTH AFRICAN BOTANY

FROM far-away South Africa comes a handful of papers by Professor Joseph Burtt-Davey, the agrostologist and botanist for the Transvaal Department of Agriculture. Quite naturally these papers have a strong agricultural bias, yet in all of them the scientific botanist may find much that will throw light upon the native vegetation of the region. One of the most interesting of these papers is that on the "Native Trees of the Transvaal" (1907), in which 269 species, representing 57 families, are recorded, and the additions made during the following year and reported in another paper, bring these numbers up to 336 species and 58 families. These are distributed through four well-marked zones, viz: (1) "The Mist-belt Forest" on the upper eastern slopes of the Drakensberg mountains, where the rainfall is heavy and the atmosphere humid. "A characteristic feature is the evergreen character of the trees, the common occurrence of epiphytes, lianes and ferns":— (2) "The High veld zone," consisting of a typical grass-steppe region, in which trees are rare. It descends to about 4,000 feet altitude: (3) "The Middle veld zone," known also as the "Bush veld," and for the most part loosely covered with trees so as to constitute a "Savannah" region rather than a real forest: (4) "The Low veld zone," restricted to the country lying below 1,500 feet altitude, and also a "Savannah" region.

Looking over the lists one notes species of *Podocarpus* (*Taxaceae*) and *Callitris* (*Pinaceae*), *Phoenix* and *Hyphaene* (*Palmaceae*), many genera and species of *Anacardiaceae, Celastraceae, Ebenaceae, Flacourtiaceae, Leguminosae, Moraceae, Proteaceae* and *Rubiaceae*. Very few of the genera are identical with ours, although one may find such names as *Rhus* (with over 20 species), *Ilex, Diospyros, Euphorbia, Vaccinium, Ricinus, Acacia, Mimosa, Cassia, Ficus, Olea, Rhamnus, Cephalanthus, Xanthoxylum, Salix, Celtis.* Aside from these the genera are quite unfamiliar to the American dendrologist.

The other papers include such topics as the breeding of maize, ramie cultivation, plants poisonous to stock, and the cultivation of alfalfa (lucerne). The latter is very full, and includes over eighty pages, with a number of illustrations.

A NEW BOTANICAL JOURNAL

EARLY in the year (February 27) the first number of a new journal appeared under the name *Mycologia*. On the title-page it is said to be "in continuation of the *Journal of Mycology* founded by W. A. Kellerman, J. B. Ellis and B. M. Everhart in 1885." It is to be "published bimonthly for the New York Botanical Garden." About the middle of April the second (March) number appeared, and we are thus able to judge as to what the new journal is to be like. The first number contains a good colored plate of agarics and pore fungi, and one black-and-white plate. The text includes twenty-six pages, and the articles are entitled "Illustrations of Fungi, I.," "The Boletaceae of North America," "Notes on North American Hypocreales, I.," "A Bacterial Disease of the Peach," "The Problems of North American Lichenology" and "Notes and News." The second number contains one colored plate of agarics and three black-and-white plates, and the text includes forty-six pages. The papers are, "Illustrations of Fungi, II.," "The Hypocreales of North America, II.," "Filling Tree Cavities" and "Notes and News."

The journal is well printed and is a worthy continuation of the *Journal of Mycology*. At the moderate price of three dollars per year it will, of course, be indispensable in every botanist's library.

LEO ERRERA

NEARLY four years ago the noted Belgian botanist Leo Errera died in his forty-seventh year. Born in 1858, he very early displayed a brilliancy of mind which indicated what he was to become in his maturity. Receiving his doctorate from the university, he studied also with Sachs, DeBary, Hoppe-Seyler, Waldeyer, Stahl and others, and became personally acquainted with Bower, Vines, Klebs, Schimper and other noted botanists of Europe. Then began a life of incessant activity, during which he prepared and published nearly three hundred papers. The earliest of these appeared when he was but a youth of seventeen years, while the last ten appeared within a year or two after his death, after having been completed by willing friends.

There is now appearing in Brussels a collection of the works of Errera under the title "Recueil d'Oeuvres de Leo Errera" which is to be completed in six volumes. The papers thus brought together (and they are a selection from all his publications) are of two kinds, viz., (1) those addressed exclusively to specialists in botany and physiology, and (2) those intended for "non-specialists who read and think." Those volumes have already appeared, viz., I. and II., devoted to general botany, and VI., containing miscellaneous papers in prose and verse. The third volume is to be devoted to general physiology, the fourth to philosophy, while in the fifth will be found pedagogical and biographical papers. The beauty of these volumes, their good paper and clear type commend them as a fitting memorial worthy of the man whom they honor.

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SPECIAL ARTICLES

DETERMINATION OF THE COEFFICIENT OF CORRELATION

IN statistical work it is often necessary to determine the coefficients of correlation between a number of variables, the calculation